

Determinants of Entry in the Indian Manufacturing Sector

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Abstract

Since 1991, the Indian economy has experienced major structural and policy changes. These changes were expected to reduce barriers to entry and increase competition. While anecdotal evidence seems to support the contention that contestability of various product markets in India has increased in recent years, due to easier entry conditions, no study has attempted a detailed empirical analysis of the same. In exploring the determinants of entry, two specific contributions are made: one, heterogeneity of potential entrants is recognized; two, appropriate econometric techniques are used for estimating the relationships. In the context of the emerging needs to study determinants of entry in the current Indian context and the research gaps, the study (1) identifies key factors that determine entry into the Indian manufacturing sector; (2) explores the difference in the factors that determine entry of different types of entrants and different modes of entry; and shows that it is analytically useful to distinguish between the impact of various causal factors on the incidence vis-à-vis extent of entry into a sector. While achieving the above objectives, the paper provides insights that will be useful for policy makers and managers designing strategies for incumbents and potential entrants.

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DETERMINANTS OF ENTRY IN THE INDIAN MANUFACTURING SECTOR

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1. Introduction

Since 1991, the Indian economy has experienced major structural and policy changes. These changes were expected to reduce barriers to entry and increase competition. In recent years, an increase in the number of players in various industries has been observed. Besides, with gradual relaxation of industrial licensing rules, existing Indian and foreign players have played a larger role in the market by diversifying and/or expanding their current operations. Interestingly, the number of entrants, both new and diversified, MNCs or Indian players, has varied across industry and product categories.

While anecdotal evidence seems to support the contention that contestability of various product markets in India has increased in recent years, due to easier entry conditions, no study has attempted a detailed empirical analysis of the same. In a deregulating environment, public policies for ensuring competition in different markets need to be informed by an understanding of factors that determine entry. This paper hopes to partly fulfill this requirement and highlight policy imperatives to improve contestability in Indian markets. From a firm's perspective, it is important to identify the factors that govern entry, as it will help in analyzing the firm's strategies. Our analysis provides some insights into the strategic needs of potential entrants and incumbents who may wish to deter entry.

Broadly, empirical research on the determinants of entry deals with three inter-related issues: (a) conceptualization and measurement of entry; (b) identification of factors affecting entry and their measurement; and (c) specification of the relationships between entry and its determinants. Most researchers treat entrants as a homogeneous category. They fail to distinguish between 'entry' by an existing player through diversification/expansion process and entry of a new player. This is desirable as the factors affecting the two types of entry are likely to be different. For example, a player already operating in the market, even in a different product domain, may be able to overcome entry barriers more easily due to lower requirement and better availability of capital (surpluses), creditworthiness or any other type of endowment like knowledge, complementary assets (e.g., distribution networks) etc. In the same vein, modes of entry of existing players (diversification, expansion etc.) also need to be distinguished. It needs to be recognized that these different types of entry can contribute to the competitive process. In short, heterogeneity among entrants needs to be recognized for better understanding of the determinants of entry. The present research seeks to capture this heterogeneity

by distinguishing between different types of entrants and their modes of entry. It has also succeeded in empirically measuring some of these conceptual constructs.

The broad factors affecting entry in all studies are essentially drawn from the classic study by Bain (1956). Subsequent literature has identified very few new determinants of entry. Consequently, there is limited scope for identifying new determinants. However, the paper improves upon earlier studies in terms of developing better measures for known determinants. It also explores certain variables which have not been empirically tested by earlier studies.

Finally, identifying an appropriate relationship between entry and its determinants is critical for any empirical investigation. In exploring various functional relationships, two specific contributions are made here: one, a separate exploration of the determinants of 'incidence' and 'extent' of entry is attempted; two, appropriate econometric techniques are used for estimating the relationships. While the need for the latter is obvious (although many studies continue to employ inappropriate techniques), the desirability of the former needs to be explained. As mentioned above, entrants may differ in terms of their endowments. This logic can be further extended to argue that the group of 'potential entrants' waiting to enter an industry is heterogeneous in nature. Such heterogeneity among potential entrants implies that not all of them are equally well endowed to enter the market. Consequently, certain entry barriers may deter large scale entry but may not be able to stop entry from taking place. Similarly, if market conditions are conducive for entry but require significant investments, the better endowed firms may enter the market but the number of such firms may be very small. As a result, the factors influencing entry may be different when one is analyzing incidence (whether entry takes place) of entry as compared to a situation where the focus is extent of entry (number of entrants). Moreover, a comparison of the determinants of "incidence" and "extent" of entry can also provide us with a mechanism to capture the heterogeneity among *each* type of entrant (new, diversifying etc.).

In the context of the emerging needs to study determinants of entry in the current Indian context and the research gaps identified above (see details below), this study hopes to achieve the following:

- 1) Identify key factors that determine entry into the Indian manufacturing sector;
- 2) Explore the possibility of any difference in the factors determining entry of different types and different modes;
- 3) Show that it is analytically useful to distinguish between the impact of various causal factors on

the incidence vis-à-vis extent of entry; and

- 4) While achieving the above objectives, provide insights that will be useful for policy makers and managers designing strategies for incumbents and potential entrants.

The rest of the paper is organized as follows. The next section attempts a brief review of the available literature on the determinants of entry in order to identify the key research gaps. The analytical and methodological issues involved in addressing these research gaps are discussed in section 3. This section also develops an econometric model which addresses most of these analytical and methodological concerns and which can be empirically investigated. The results of these empirical investigations are analyzed in section 4 in order to generate insights into the determinants of entry in the Indian manufacturing sector. The final section tries to relate the findings to policy options and identifies some limitations of research.

2. Identifying and Addressing Research Gaps: Analytical and Methodological Concerns

Following the issues raised above, the discussion of the research gaps and how the current studies have tried to address them is organized around the definition of entry, its determinants and the conceptualization of the relationship between the two.

2.1 New Conceptualizations of Entry and their Implementation

As mentioned, the key question is whether all modes of entry or all types of entrants encounter respond and react similarly to the market dynamics. In order to pursue this question one needs to identify various types of entry and their modes, for a precise and proper conceptualization of entry. Hines (1957) and much later Gorecki (1975) argued that entrants are not a homogeneous class. The latter study, probably for the first time, empirically distinguished between two types of entrants – existing players involved in diversification and new players. His main conclusion was that the factors determining entry may vary across the different types of entrants. More specifically, some or all of conventional barriers to entry may operate less severely against the diversifying entrants as compared to the new entrants. For example, diversifying firms may be able to raise capital from the market at lower costs as compared to new entrants because of the various imperfections in the capital markets or due to lesser risk attached to lending to a larger diversifying enterprise. In short, what serves as a serious entry barrier to a new enterprise may not be so significant a barrier for a diversifying enterprise.

Surprisingly, this powerful conceptual idea of heterogeneity among the entrants has not been carried forward in any significant manner in the subsequent theoretical studies, nor has it been a subject of many empirical investigations.¹ Any effort to carry forward this critical idea needs to distinguish between the 'types of entrants' and 'modes of entry'. In other words, the variety of ways in which 'entry' can take place need to be explicitly recognized. Conventionally, entry in industrial organization models is equated with the setting up of new plant and equipment by a new enterprise resulting in higher capacities in the market. The empirical investigations have typically focused on identifying the determinants of 'extent of entry' or number of new enterprises (entrants) in a market. Building on Gorecki's insights, while conceptualizing entry two inter-related issues need to be resolved:

- 1) What dimensions of the heterogeneity among the 'entrants' need to be distinguished?
- 2) Should one recognize the heterogeneity in the 'modes of entry'?

2.1.1 Capturing heterogeneity among entrants

As mentioned, Gorecki (1975) emphasized the distinction between 'new' and 'existing' players. However, there can be significant heterogeneity among the 'existing' players. The existing player may belong to the same industry/product group for which entry is being considered. Alternatively, it can belong to a related industry or to an unrelated industry or to a completely different sector altogether. Besides, the player may be domestic enterprise or a foreign entity. Moreover, existing players may also differ in size, capabilities, access to complementary assets etc. *Ceteris paribus*, barriers to entry may be less severe and may not deter entry of a well-endowed firm in a related industry. In contrast, a less endowed firm operating in an unrelated industry may find barriers to entry too severe to overcome. Consequently, a distinction between 'types' of entrants makes analytical sense.

2.1.2 Capturing modes of entry

A new player in the market can create new capacities or 'enter' through acquisitions or joint ventures. A foreign player can also 'enter' through the import route. Similarly, an existing domestic player can either 'enter' a specific market through Greenfield investments or through the mergers and acquisitions route. Besides, an existing player in the market can expand capacity in the same market. Prima facie, 'entry' through expansion in an existing plant or through a new plant may be less difficult than 'entry' of a new player or diversification in a new sector. The key issue is to recognize that different modes of 'entry' may face different barriers or may require different types of capabilities and/or investments.

¹ There are a few exceptions like Hamilton (1985) who distinguish between "dependent" and "independent" entry. It has also been found that survival rates are better for diversifying entrants than for independent new entrants. See Geroski (1991, 1995) and Lyons (1991) for literature reviews.

Most studies use “number of entrants” as a measure of entry.² The available literature has not explicitly combined ‘types of entrants’ and ‘modes of entry’ to achieve a broader conceptualization of ‘entry’. Such a conceptualization recognizes that entry needs to be thought in terms of new sources of supply and not merely as new sources of production. Besides, various dimensions of ‘new’ and ‘diversifying’ entrants need to be captured while analyzing determinants of entry. The present study has made an effort in this direction. Moreover, it will also be argued later that for analyzing the determinants of entry for a heterogeneous group of potential entrants, it may be useful to distinguish between the “extent” and “incidence” of entry in a sector. The former captures the number of entrants and the latter focuses on whether or not entry has taken place in a sector.

2.1.3 Operationalising Heterogeneity in Types and Modes of Entry

The whole idea in capturing entry activities is to study their effect on the competitive process. Entry by expansion activities of existing players or entry by acquisition of an old-established firm can affect the competitive process as much as the entry of a new player (new legal entity). That is, entry can be thought of as new sources of supply, regardless of whether this involves new sources of production. While extending the conceptual boundaries of “entry” is very challenging and potentially useful, an empirical implementation of many such conceptualizations is virtually impossible. This research, given the limitation of data, has been able to focus on extending the basic distinction made in the literature between “new” and “diversified” entry. To the extent feasible, the available data has been used to define analytically meaningful entry categories.

To start with, entry in this research has been considered as an activity of a firm/organization resulting in building up a new plant/unit or expanding capacity of the old plant, *entry through mergers and acquisitions is not considered*. When a firm completes a project involving any one of the activity listed above, it is considered as an “entry” activity. The data on Greenfield projects from the Center for Monitoring Indian Economy (CMIE) have been used to operationalize entry categories. The project completion date and the industry are considered as ‘entry date’ and ‘entry industry’ respectively. The CMIE data helps us identify two types of entrants/players (existing and new player/legal entity) and six types of entry modes (see Appendix I for details). A combination of entrants and modes of entry throws up the following categories of entrants in the manufacturing sector:

² It is either used as the absolute number of entrants or as the “rate of entry” which is the number of entrants divided by the number of incumbents (see Geroski, 1991, especially chapter 2).

Type I. New Player in the market (new legal entity)³

- a) *Affiliated*: A new legal entity in the market which never operated in any industry before, but promoted by an enterprise or group/business house which has been in business earlier, either in the manufacturing or the non-manufacturing (trade/service) sectors. Agriculturalists entering into manufacturing are not captured here.
- b) *Unaffiliated*: A new legal entity in the market promoted by an enterprise/ group which never operated in any non-agricultural activity (manufacturing or non-manufacturing) before.

Type II. Entry through diversification

- a) *Diversification into a new product*: An existing player in the manufacturing sector completing a project resulting in building a new plant/unit where it plans to produce products which were not there in its product portfolio prior to completion of this project.
- b) *Diversification into a new sector*: Completion of a project in the manufacturing sector by an existing player where the firm is classified into a sector other than the manufacturing sector.

Type III. Entry through expansion

- a) *Expansion through a new unit*: An existing player (legal entity) in the manufacturing sector, completing a project resulting in building a new plant/unit where it plans to produce products which were there in its portfolio prior to completion of this project.
- b) *Expansion of Capacity*: An existing player in the manufacturing sector, completing a project resulting in expanding capacity of its existing plant.

In general, Type I entry is likely to be more difficult requiring larger capital outlays and other investments than Type II. Similarly, entry of Type II is likely to have higher capital and other requirement than of Type III. Consequently, *ceteris paribus* barriers to entry are expected to be more significant for Type I entrants, followed by Type II and Type III entrants. Within each type, barriers to entry are also likely to be different. *Ceteris paribus*, among Type I entrants, new firms not

³ If a new legal entity is created through a joint venture that will also get classified here. It also needs to be noted that if the new entity is created by the growth and/or diversification by a small enterprise that was previously outside the CMIE database because it was unincorporated (e.g. an unorganized sector unit or partnership), it would be included in type I. This may create certain difficulties in interpreting the determinants of this type of entry. Unfortunately, it is difficult to take care of this problem due non-availability of data. It is expected, however, that the entry barriers faced by such enterprises may still be higher than the ones faced by larger firms that are part of the CMIE database. To the extent this is correct, the differences between the determinants of different types of entry would still provide some useful insights.

promoted by existing entities may face more barriers.⁴ However, it is difficult to predict the difference in the entry barriers faced by the two types of diversifying entrants (Type IIa and Type IIb). *Prima facie*, a firm diversifying into manufacturing from a non-manufacturing sector may face a more difficult scenario as compared to a manufacturing firm diversifying into the production of a new product. But the difficulties experienced may be similar if the new product for the manufacturing firm is very 'distant' from the existing product profile. In such a situation, existing firms may not be able to leverage existing capabilities and assets for the launch of a new product. Unfortunately, the available data does not permit us to measure the 'distance' between the new and the old activity. We are not even able to classify the projects into related or unrelated diversification. Finally, entry through expansion within the same plant is likely to be easier than through setting up a new unit.

Looked at differently, Type I and Type II entrants can be categorized as 'new' entrants in a given product market, while Type III entrants are the firms conventionally known as 'incumbents', expanding their role in the market. In a broader sense, however, Type II entrants can also be classified as 'incumbents' as they existed as firms before entering the relevant product market. If we adopt a broader definition of incumbents, only Type I entrants can be categorized as 'new'⁵. Given the three types of entrants and six modes of entry, we seek to explore if the determinants of entry differ for these categories. All types of entrants (Type I – III) can be combined together to analyze entry in an aggregate sense. The major distinction in the next step is between new players and existing players using diversification and expansion modes of "entry". In general, we have focused on the comparison of the determinants of entry across the groups defined above. In some cases, we have attempted a more disaggregated comparison to highlight certain key differences.

2.1.4 *Heterogeneity within Each Type of Entrants*

While the barriers faced by the existing firms may be different from the new ones, there can be considerable heterogeneity within each category of potential entrants. Some potential entrants may be better endowed than others in each category. For example, some manufacturing firms may have the wherewithal to enter into a new product market while others may not be in such a situation. Thus, notionally one can think of a queue of "potential entrants" for each type of entrants wherein entrants at the top of the queue are better placed than others to benefit from the emerging opportunities of entry. For example, Cotterill and Haller (1992) and Fuentelsoz and Gomez (2001)

⁴ The distinction between the first and the other two categories is essentially in terms of whether a new legal entity is created or not. This distinction by itself may not make a qualitative difference for the economic implications of entry. However, as suggested above, the entry barriers faced by different categories may differ. ,

⁵ One can argue, of course, that new firms or legal entities promoted by existing entities are not strictly new players in the market. We shall revert to this issue when we discuss the results of our empirical analysis.

have highlighted in the context of supermarket and banking industries respectively, that locational proximity can put certain potential entrants at the head of the queue. This type of heterogeneity is different from the one captured by the entrant type and mode categories defined above. We have tried to explore such heterogeneity as well in our analysis by combining two different econometric techniques to analyze the determinants of entry (see discussion below).

2.2 Determinants of entry

Studies on determinants of entry have identified variables that capture factors inducing and deterring entry. Bain's (1956) influential work identified product differentiation, economies of scale and absolute cost advantages as key determinants of entry. Subsequent studies in the industrial organization literature referred to these as *barriers to entry* and tried to identify variables, which capture these barriers. Largely built on the modified Structure-Conduct-Performance (S-C-P) framework wherein feedback loops (e.g., from conduct (strategy) to structure) are recognized, these studies identify a variety of industry characteristics that may influence entry into an industry.⁶ In the same tradition, the entry model developed here presumes that entry of firms is determined by certain industry characteristics. The model to explore determinants of entry builds on the broad factors identified by studies using the S-C-P framework. To facilitate discussion, the explanatory variables have been categorized into three groups: Structure, Conduct and Performance related factors. It is recognized, however, that a watertight compartmentalization of these factors is inappropriate and hence these three categories are often porous. In the process of discussing these factors to build an explanatory model, we also review some key empirical studies on the determinants of entry.

2.2.1 Structural Characteristics

A variety of structural variables have been identified in the literature that can determine entry. In what follows we briefly discuss them.

Herfindahl Concentration Index (CR): Number of firms operating in an industry and the distribution of market shares among them reflect one of the key structural characteristics of the industry. In perfectly competitive markets, larger number of operating firms along with certain other conditions provides business opportunity and makes entry easy for other entrants. But merely the number of firms operating in an industry is not a good measure of entry opportunity presuming a perfectly competitive environment. Even when the number of firms operating in the industry is high, market shares may be unevenly distributed with only a couple of firms dominating the market. It is

⁶ See Lyons (1991) and Geroski (1991, especially chapter 5) and Geroski, Gilbert and Jacquemin (1990) for good reviews of this literature.

the interaction of both the number of firms and the distribution of market shares, which reflects the ensuing barriers to enter an industry. The Herfindahl index for an industry takes into consideration both the number of operators and the distribution of market shares.

As one moves from a situation with a large number of firms with small market shares to small number of firms with large market shares or a few firms dominating the market, possibilities of concerted action post entry tend to increase. To generalize, the higher the concentration in an industry, the greater the possibility that post entry retaliatory actions and collusion may deter entrants. The inherent change in the nature/degree of the competition post entry influences the entry decisions. The possibility also exists in a concentrated industry, of mergers or acquisitions as modes of entry resulting into enhancement of concentration. Entry by large firms and MNCs has been characteristic of creation of such market conditions (Rosario, 1999).

Empirically, the impact of industry concentration on entry has varied across studies and no consistent pattern seems to emerge (Acs and Audretsch, 1989, Geroski, 1995). A few studies, however, have found that *ceteris paribus*, high industry concentration deters entry into the industry (see, for example Orr, 1974; Khemani and Shapiro, 1986; and Saikia, 1997). Industry concentration in this study is measured by the Herfindahl Index (H-Index) which is measured as:

$$H\text{-Index} = \sum (\text{Market Share})^2, \text{ where market share} = \text{Firm Sales} / \text{Total Industry Sales}; \text{ and } N = \text{number of firms in the industry}.$$

Minimum Efficient Scale (MES): The fixed cost component in production varies from industry to industry. With high fixed costs, the scale of operation required to operate efficiently increases in order to cover the fixed costs and to keep average costs low. Existing firms operating at the efficient scale can erect barriers for entrants because of cost disadvantages of operating at scales below the efficient scale. Firms operating at scales below the efficient scale are at a cost disadvantage compared to those operating at the efficient scale. Given the size of the market and its growth, higher the level of MES, higher is the likelihood that the new entrant may have to operate at a sub-optimal scale. This may restrict entry. In the same scenario, assuming incumbents will hold their supply constant, entry will result in excess supply and a decrease in prices resulting in inefficiencies from the revenue side given the cost component. If the incumbents keep the market-clearing price, individual firm's output share to the market will need to be reduced to accommodate the new entrants. Consequently, the new players are unlikely to attain the scale to support the fixed costs. In a sense, with an increasing minimum efficient scale of operation, the barriers erected are arising from

relative cost disadvantages. Moreover, a high MES can also exacerbate the entry barriers based on capital market imperfections discussed below.

Gorecki (1975), Kessides (1986) and Saikia (1997) explored the role of MES in determining entry but did not find it to be a significant deterrent. Acs and Audretsch (1989) have found that high concentration adversely affects entry by small firms. In our study we will be using average scale of operation⁷ as a structural variable reflecting barriers created by economies of scale and it will be measured as:

$$MES = \text{Log} [\sum (\text{Firm Sales})/N], \text{ Where } N = \text{No. of firms in the industry}$$

Industry Size (SIZE): A larger industry size provides scope for larger number of players. Given MES, larger the size of the industry, better the scope for more players to enter and operate at an optimal scale and even for existing players to expand and diversify. Both Orr (1974) and Saikia (1997) have found industry size to have a positive influence on entry. In this study, size of the industry is used to measure the scope for entry. It is measured as:

$$\text{Size} = \text{Log} (\text{Industry Sales})$$

Capital Intensity (CI): The scale to operate efficiently varies from industry to industry subject to the fixed cost components. Hence, given the capital requirements in an industry to build a plant of efficient scale, the decision to enter raises exogenous sunk costs related barriers to entry. The capital requirement to build up a plant of efficient scale varies from industry to industry, as do MES. Hence, the exogenous sunk cost component as a barrier to entry also varies across industries. Moreover, capital market imperfections may lead to discrimination in terms of lending rates or sometimes non-availability of capital for small players. Besides, discrimination by offering preferential rates to large established players in capital intensive industry can also act as barrier to entry for small new firms, as a higher rate of cost of capital will increase their overall cost making them less competitive.

While the study by Orr (1974), Khemani and Shapiro (1986) and Duetsch (1984) found capital requirements to be an important barrier to entry, Highfield and Smiley (1987) and Saikia (1997) did not find the associated sunk costs to be a significant determinant of entry. Capital intensity of the industry represents barriers related to capital requirements, availability, lending rates and sunk costs. It is measured as:

$$\text{Capital Intensity} = \text{Capital Employed in the Industry} / \text{Industry Sales}$$

⁷ MES is calculated from cost-production data by product at the factory level. Because of non-availability of data, average scale of operation as a measure reflecting the efficient scale of operation is adopted.

Vertical Integration (VI): Forward and backward integration in industries may be an outcome of strategic responses of firms operating in the industry or may be naturally built up as part of industry structure. Firms, who strategically develop backward and forward linkages, reap cost efficiencies by internalizing ensuing positive externalities. At an entry stage, with not so developed forward and backward linkages, new entrants face barriers arising out of cost inefficiencies in case of entering vertically integrated industries. Moreover, if the entrants wish to enter as a vertically integrated entity, the costs of entry go up. *Empirical studies on determinants to entry have not explored the role of vertical integration.* Barriers arising from such backward and forward integration will be captured in this model by a measure of vertical integration:

$$\text{Vertical Integration} = \text{Industry Gross Value Added} / \text{Industry Sales}$$

2.2.2 Conduct Characteristics

Behavior of firms may be an outcome of strategic responses or may be a natural response to certain characteristics of the industry. For example, consider the case where the research and development activity in an industry is very high. Investment in R&D activity may be a strategic move of an incumbent to create knowledge barriers for the entrants or may be the outcome of the industry requirement where the need is to invest heavily in R&D for new product development and technological up-gradation. Discussed below are a few measures that capture the conduct features that may determine entry of firms. In general, it is well recognized now that firms strategically behave to change “structural” characteristics of the industry in order to deter entry (Geroski, Gilbert and Jacquemin, 1990 provide a review).

Product Differentiation and Intangible Assets: Product differentiation not only gives some flexibility for firms in charging a price premium, but also functions as a source of entry barrier. This is so because there may be costs related to switching brands. In such a case, products, which are identical *ex ante*, may be viewed as imperfect substitutes once the consumer has chosen a particular brand. Thus, a new entrant might have to incur additional costs in convincing the consumers to switch brands.⁸

⁸ Several studies have made this argument (e.g., Yip, 1982; Farrel and Shapiro, 1988). Empirical studies have shown that late entrants have to spend more on advertising (Urban et al. 1984, Lambkin, 1988) but pioneers continue to enjoy a larger market share and higher profits (Lambkin, 1988). Grabowski and Vernon (1982) studying the US pharmaceutical industry found that heavy brand promotions tended to protect pioneering firms from entry even long after patents expired.

As mentioned, Bain (1956) observed that product differentiation was a very important determinant of the ability of firms to earn supernormal profits. His empirical investigations showed that the following factors contributed to product differentiation related barriers in twenty industries: customer inertia; habit and loyalty; advertising-induced brand allegiance and product reputation. The degree of product differentiation in a market is measured by the cross elasticities of demand and supply, which exist among competing products. Although advertising is only one source of product differentiation, it is important for certain consumer goods industry. In these industries, new entrants generally are forced to sell at a price lower than that of the incumbent's branded products. The unbranded products of a new entrant and the branded products of the existing player may not be having any "real" difference between them but the new player is often forced to sell its product at prices below that of the established products or else face heavy selling costs. Advantages emanating from brand names, managerial skills, distribution networks, product patents are referred to as intangible assets advantage. This study has made an effort to capture product differentiation and intangible assets related factors that may influence entry decisions. In what follows, the details of these factors are discussed. Data requirements for the computation of cross-elasticity are very high. Consequently, most studies use advertising intensity as a measure of product differentiation (Orr, 1974; Gorecki, 1975; Kessides, 1986 Khemani and Shapiro, 1986; Duetsch, 1984, Highfield and Smiley, 1987 and Saikia, 1997). We use this along with a few other variables like marketing and distribution investments as other sources of product differentiation. At one level, R&D investments can also be viewed as a dimension of product differentiation in an industry.

Advertising Intensity (AI): Following Kessides (1986)⁹, product differentiation via advertising can deter entry in three ways. First, high levels of advertising create additional (partly sunk) costs for new entrants as it requires brand switching to break in buyer inertia and buyer loyalty as compared to repeat buying. Secondly, the effect of advertising on firm revenues (and therefore profits) may be subject to economies of scale, which result from the increasing effectiveness of advertising per unit of output sold and decreasing costs for each advertising exposure.¹⁰ Thirdly, advertising requires funds and since the returns are in the form of intangible assets formation, the certainty of returns is low. But while these processes may deter entry, advertising intensive industries also provide

⁹ He constructed a model of entry behaviour which isolates three separate effects of advertising: the effect on the measured rate of profit, the effect on the irreversible (sunk) costs of entry, and the effect on the risk of entry as perceived by the potential entrants. The main contribution of Kessides (1986) was to conceptually and empirically distinguish between the sunk costs associated with advertising from the effect of advertising on brand building and information provision. His results showed that, for the potential entrant, the need to advertise leads to an unrecoverable entry cost in the case of failure, and thus advertising creates a sunk cost barrier to entry. On the other hand, according to his finding for the majority of the industries examined, the overall impact of advertising intensity on entry is positive, that is advertising acts as a source of information and actually facilitates entry.

¹⁰ Also see Comanor and Wilson (1979) on the issue of scale economies in advertising.

opportunities for potential entrants to make a dent in the market through advertising that provides *information* about the new entrants and is able to *persuade* consumers to switch to a new producer. Advertising intensity captures the effect of all these processes and provides a proxy for the importance of intangible assets in building up a brand name and the extent of product differentiation in the market. The higher the level of advertising, higher is the expected differentiation in the market which may act as a barrier to entry. It is measured as:

$$\text{Advertising Intensity} = \text{Industry Advertising Expenditure} / \text{Industry Sales}$$

Distribution and Marketing Intensity (DMI): Local market links and market penetration are significantly dependent on the quality of a firm's distribution network. Investment in building up distribution networks is a major activity in markets for FMCG products. Existing firms having good distribution network enjoy cost advantage in the channels. Activities like after sales service, promotion and consumer relationship management help in building up intangible assets in the form of brand image and brand loyalty. Products introduced in the market by a new player have to not only build the brand image, but also break the 'customer inertia' in order to gain market share. This process is usually a time consuming one and the incumbents have the first mover advantage, which they can build on by attracting consumers through brand extensions in related products. Hence barriers created by such intangible assets help existing players reap supernormal profits while deterring entry. Existing studies have not explored the role of this source of "product differentiation" and "sunk costs". In our study it is measured as:

$$\text{DMI} = \text{Industry Distribution \& Marketing Expenditure} / \text{Industry Sales}$$

Research and Development: As mentioned, investments into R&D activity may be an outcome of strategic responses or natural to the industry characteristics. Industries with high R&D expenditure are mostly industries where products have short life cycle and new product introduction gives a strategic upper edge over one's competitors; and also in case of technology intensive industries. In either case, investment in R&D erects barriers to entry arising out of endogenous sunk costs. The time period involved in recovering the investments also raises uncertainty, which is also likely to deter entry. But in certain cases, firms can purchase foreign technology and product licenses rather than developing it in-house. In such cases the process of entering a market by purchase of technology and know-how may actually help entrants rather than erecting barriers. Therefore, liberalization of foreign technology purchase related policies can facilitate entry (Basant, 2000). R&D and technology purchase intensity can also be seen as a measure of "technological opportunity" in a sector (Acs and Audretsch, 1989; Highfield and Smiley, 1987) that creates opportunities for new entry. In principle, technology based entry can take place through the R&D efforts of the entering firms as well as

technology purchase, but the uncertainties are likely to be higher in the case of the former.

Few studies have explored the impact of R&D intensity on entry (Orr, 1974, Highfield and Smiley, 1987 and Acs and Audretsch, 1989). While Orr (1974) did not find it to be significant, the other two found conflicting evidence. Highfield and Smiley (1987) found it to have a positive impact, the other study found it to be a significant entry barrier for small firm entry. In this study, foreign technology know-how fees (FTP) and expenditure on R&D (RDI) are used to capture technology related barriers. These are measured as:

$$FTP = \text{Industry foreign technology purchase expenditure} / \text{Industry Sales}$$

$$RDI = \text{Industry R\&D expenditure} / \text{Industry Sales}$$

Export Orientation (EI): In order to sustain economies of scale, firms may cater to export markets at competitive prices when the industry size in the domestic market is not able to sustain the size of the operation. A firm having a good network abroad, may enter an industry which is highly concentrated and having high economies of scale by operating across markets which may not be a possibility for a purely domestic operator as large scales of operation are not supported by internal demand. On the other hand, the opening up of an industry through trade liberalization and an increase in the size of the industry, may help small domestic players to take a piece of the pie which otherwise was not possible. In short, the basic idea is that export markets may provide opportunities for domestic players to operate in certain industries and achieve optimal scales where domestic demand constrains them from doing so. But the underlying assumption is that their quality of products is good and they have access to good network abroad to market the products. So in sense on one hand better opportunities may induce entry, but delivering the product quality at the international standards and network to market the products may act as a barrier. The role of export orientation of an industry on entry in that industry has not been analyzed and we are exploring the relationship for the first time. It is measured as:

$$EI = \text{Industry Exports} / \text{Industry Sales}$$

It may be argued that the links between certain structural factors and conduct factors can exacerbate the entry barriers created by the former. For instance, building up brands, promotional and marketing activities, building distribution networks, R&D activities all lead to development of intangible assets which an incumbent can play to its strength and raise barriers for the entrants. Inherent in all these is capital expenditure and that is where it gets linked with the capital market imperfections and the structural characteristics. Consequently, due to the factors listed above, raising capital for an advertising campaign or building distribution channels or developing knowledge base via R&D, is

likely to be difficult or costlier for an entrant. Consequently, high advertising intensity, distribution and marketing intensity and R&D intensity are also likely to exacerbate capital market imperfections.

2.2.3 Performance Characteristics

The potential of making profits, experiencing growth and a variety of other “performance” characteristics of an industry may influence the decision to enter an industry.

Risks and Returns: Entry as such can be viewed as an investment (capital) decision. With various investment options available to an investor, it is the opportunity costs which one needs to analyze while taking the decision. Operationalisation of this idea requires the analysis of risks involved and the returns associated with various investment options. Using this risk-return perspective, we describe below some variables, which are used to capture the ‘opportunity costs’ of entry across industries. The role of risk has also been explored in some earlier studies (See Orr, 1974 and Saikia, 1997). In general, entry is found to be slow to react to high profits (Geroski, 1995).

Return on Capital Employed (ROCE): The decision to enter an industry is expected to be influenced by the performance of the industry. It is expected that industry with high returns will attract more entrants as compared to industries with low returns (Orr, 1974, Khemani and Shapiro, 1986; Deustch, 1984; Higfileld and Smiley, 1987; Kessides, 1986, Saikia, 1997). This is true for new players and also for existing players who plan to diversify or expand (Gorecki, 1975). Lagged profits are used to proxy expected profits post entry. Different strategies are adopted by the existing players to increase their hold of the market - they introduce new products, expand capacity & supply of existing products, and bring in new technology. The underlying objective may be to exploit the opportunities available in a profitable industry. Returns as an indicator of performance will be captured in this study by introducing ROCE as an explanatory variable and it is measured as:

$$ROCE^{11} = PBIT / Capital\ Employed \quad (both\ calculated\ at\ industry\ level)$$

Risk: In general, higher risk is likely to reduce the likelihood of entry taking place unless the potential entrant is risk prone. Conventionally, studies have measured risk as variability in industry performance over time; high variability implying higher risk involved. In this study we have tried to

¹¹ In IO literature, economists have measured monopoly power and to some extent profitability with price-costs margins (PCM). In the perspective of entry being considered as an investment decision, the evaluation from an opportunity costs point of view in terms of risks and return, ROCE was found to be more apt and hence followed in this research. Empirical estimation also showed ROCE to be more appropriate than PCM.

capture risk from the perspective of the potential entrant in two ways. Variations in the industry profitability over time capture, on an average, the *operating risk (Industry Risk)* for that industry. However, given the levels of returns and variations over time, for a potential entrant it might be important to know if there is variability in returns across firms in an industry in a year. High inter-firm variations imply that there are possibilities of making higher than average profits. Variations in profitability across firms in an industry, therefore, capture the *entrepreneurial risk (Entry Risk)*. While industry risk has been considered by earlier studies (see studies quoted above), the role of entrepreneurial or entry risk on entry decisions has not been explored in the literature.¹² The relationship between these two types of risk and incidence/extent of entry will reflect the average strategic response, to such risks in terms of entry. It will be measured as:

Industry Risk (IR) = Standard Deviation (Industry ROCE) over the last five years with a lag of one year¹³

Entrepreneurial Risk(ER) = Standard Deviation (ROCE of firms in an industry in a year)

Growth: A growing industry creates more opportunity for existing players who plan to expand as well as for new players who plan to start their business. Gorecki (1975) found that industry growth has a positive influence on new as well as “diversifying entry”. Khemani and Shapiro (1986), Deutsch (1984), Highfield and Smiley (1987) and Saikia (1997) also found that growth induces entry. In this study we measure it as:

Sales_t = Sales₀ (1+g)^t, Where 'g' is the growth rate, regressed over a period of five years with a one year lag in the starting year.

Broadly then, most studies have been able to capture the structural aspects of the industry by using variables like minimum efficient scale, capital intensity and size of the industry. But none of the studies have explained the role of vertical integration in an industry. From the perspective of conduct features, most of the studies have captured the effect of product differentiation related barriers by including variables like advertising intensity of the industry. However, such barriers may include assets like distribution networks, marketing skills and reach, and knowledge in terms of R&D and technology purchase. With the exception of Orr (1974) and Highfield and Smiley (1987), who has explored the role of R&D, no researcher seems to have explored the role of intangible assets other than brands in entry decisions. Moreover, from the point of view of analyzing entry as an investment

¹² Geroski (1995) provides an interesting discussion on the problems associated with the interpretation of the relationship between industry risk and entry. He does not, however, mention the role of entrepreneurial risk.

¹³ See Appendix for more details on time lags and other measurement issues.

decision, the need is to adequately capture opportunity costs. To an extent, these are reflected better by returns and risks on the capital employed. Although a couple of studies have tried to capture these factors through various measures of risk and profit rates, some measurement issues remain. Risk has been looked from the industry perspective as variations in its performance (profitability) over time. The underlying logic is that the overtime variations in industry profitability, capturing risk across industries, will influence the choice of industry of entry. There is also a need, however, to capture the risk arising from the performance of firms within an industry. Variations in firm level profitability within an industry reflect the potential of profits, post entry. Besides certain variables capturing policy shifts and its implications needed to be captured, for instance technology purchase and export orientation especially in the context of India post 1991. The study tries to fill these gaps.

2.2.4 Functional Relationship and Analytical Techniques

For the identification of the functional relationship, research on the determinants of entry of firms has used two main approaches. One is the indirect approach, in which profitability as a dependent variable is explained by factors like concentration, economies of scale, advertising intensity etc. Prominent among these studies have been Comanor and Wilson (1967) and Miller (1969). Most econometric investigations of entry barriers using this approach have only provided indirect tests. In this method of study, profitability rather than entry is used as a dependent variable and is regressed on those structural factors considered to raise barriers to entry. The main reason for adopting this methodology has been the non-availability of data on 'entry', and hence profitability is used as a substitute with the assumption that high profitability attracts large entry. Critics have argued against this approach on several grounds. Firstly, the dependent variable is a surrogate measure, secondly, there may be a gap between true and measured profit and lastly, related measurement errors of profit may enhance the unreliability of estimates. Given the availability of data, it makes sense to use 'entry' as the dependent variable instead of using profitability. This approach referred to as the direct approach better serves the objective of analyzing the determinants of entry, as it does not assume direct relationship between profitability and entry. It was Orr (1974) who first pointed out the shortcomings of the indirect approach and since then given availability of data on entry, direct approach has been the preferred methodology in the literature. In this approach 'entry' rather than rate of profit is regressed on factors influencing entry.

As mentioned, most studies fail to recognize the heterogeneity among entrants, actual or potential. Consequently, they do not distinguish between potential entrants who have the endowments to enter when investment requirements or entry barriers are high and those which may not have the wherewithal to overcome these barriers even when entry is profitable. These endowments may take

the form of availability of capital, strong brands, distribution networks, technological capabilities and so on. As discussed, one approach to address this research gap is to distinguish between 'types of entrants' and 'modes of entry'. The other possibility is to estimate the determinants of entry separately for the 'incidence' and 'extent' of entry. If heterogeneity in the queue of potential entrants is recognized, with the most well-endowed entity standing at the top of the queue, only these may be able to enter if entry is profitable but entry barriers are high. As a result, the influence of factors affecting entry may be different on the 'incidence' of entry vis-à-vis its 'extent'. A comparison of these two influences can provide insights about the heterogeneity among entrants. For instance, barriers related to capital availability and its costs are seen as important determinants of entry. However, capital intensity might not act as a significant barrier to the incidence of entry, as the firm at the top of the queue might be a diversifying large firm able to pool in resources with better bargaining power and so on. But capital intensity may continue to be a significant barrier for most entrants as they may not have adequate access to the capital markets. This will result in lower number of entrants or to say lower 'extent' of entry. Extending the same logic, determinants of "incidence" may differ from those of "extent" of entry for *each* type of entrant.

Most earlier econometric analyses of the determinants of entry have used the ordinary least squares (OLS) technique. This method creates biases as entry may not have occurred in many industries. As a result, there are a large number of 'zeros' on the left-hand side of the estimated equation. A censored regression approach is required in such a situation to analyze the 'extent' of entry, which has been used in recent years (see Geroski, 1991, Chapter 5). Similarly, analysis of the factors determining 'incidence' of entry will require a limited dependent variable approach. The present study has used appropriate econometric techniques to take care of the problems in the current literature. The details of the same are discussed in the next section.

To summarize, the present study seeks to (a) distinguish between different types of entrants & modes of entry; (b) explore the role of a larger set of determinants of entry; and (c) use better econometric techniques and specification of the variables & the functional relationship. This is expected to provide more reliable estimates and take into account the heterogeneity of entrants.

3. The Entry Model and Tools of Analysis

Types of entry and their determinants in the form of explanatory variables have been discussed in the earlier sections. This discussion broadly distinguished between: i) entry by a new player (new legal entity); ii) entry through diversification; and iii) entry through expansion. This section regroups

types of entry further for estimation purposes. This is followed by a discussion of various models of entry estimated by us and the analytical tools used in this study.

3.1 Redefining Entry Categories

The purpose of regrouping the types of entry categories into certain entry groups is to explore if the determinants of entry are different for qualitatively different classes of entry. As discussed earlier, few studies distinguish between different types of entrants. It was Gorecki (1975) who first argued that barriers to entry are likely to be different for new players entering the market vis-à-vis existing players who are diversifying into the market in question. Typically, existing players are likely to have better access to capital that gets translated into better access to complementary assets like manufacturing, marketing, distribution apart from intangible assets resulting from resource intensive R&D and advertising activities. Most of our analysis is here is restricted to the four types/modes of entry. If required, detailed estimated results of other models are also referred to add additional insights. The five types of entry focused upon are:

Type I. New Player in the market (all new legal entities)

Ia: New legal entities - affiliated

Ib: New legal entities - unaffiliated

Type II. Entry through diversification

Type III. Entry through expansion

3.2 Specifying Models of Entry

Even after different types of entrants and modes of entry have been clearly identified, the specification of the dependent variable "entry" is not complete. To address the identified gap in the literature we distinguish between the "extent" and "incidence" of entry. Extent of entry is simply defined as the total number of entrants in different categories of entry defined above, across industries. Most studies of entry use the 'extent' specification. To it we have added another specification which is referred to as 'incidence' of entry in a category. It is operationalised as dummy dependent variable that takes the value of "1" if entry in a specific category has taken place, else it is equal to "0". Thus, the incidence of entry captures the influence of the explanatory variables on the occurrence of the event called "entry". As mentioned earlier, the main purpose of differentiating "incidence" of entry from "extent" of entry is to explore if the two are differently influenced by the determinants of entry. For example, in an extreme situation while high levels of product

differentiation in an industry may deter large-scale entry due to high resource requirements, single players may use the product differentiation route to enter the industry. The argument follows from appreciating the fact the entrants are a heterogeneous class. Because of differences in their basic endowments they have different capabilities which may help them to enter an industry but this might not be the case for a larger number of players. Following this argument, different variables capturing barriers to entry may have a more significant negative effect on the 'extent of entry' than on the 'incidence of entry'.¹⁴

As discussed, the set of industry level determinants explored in our analysis include: concentration ratio, size, minimum efficient scale, capital intensity, advertising intensity, marketing and distribution intensity, R&D intensity, intensity of foreign technology purchase, export intensity, ROCE, operating risk, entrepreneurial risk, vertical integration and growth. All these are measured at the industry level.¹⁵

Overall, therefore, we have two basic models as:

$$\text{Number of entrants} = F [S (\text{CR, SIZE, MES, CI, VI}), C (\text{AI, DMI, RDI, FTP, EI}), \\ P (\text{ROCE, IR, ER, GR})]$$

$$\text{Incidence of entry} = F [S (\text{CR, SIZE, MES, CI, VI}), C (\text{AI, DMI, RDI, FTP, EI}), \\ P (\text{ROCE, IR, ER, GR})]$$

Incidence value is 1 for a specific year if entry has occurred in an industry, else it is 0. The number of entrants is the sum total of all of entries in an industry group in a specific year. The probit model is used to estimate the "incidence" version of the model while tobits are used to estimate the model on the "extent" of entry. Appendix II provides the details of these models.

All the explanatory variables are measured with lags. It is presumed that the decision by an entrant to enter an industry or expand is based on the observed industry characteristics over a period of time prior to entry. In other words, entry by firms in a specific year is based on the industry characteristics for a few periods prior to the period of entry. In this study it is assumed that a period of three years

¹⁴ Some studies have made the distinction between "incidence" of entry and "extent/rate" of entry and have used the econometric equations similar to ours (see Geroski, 1991) but none to the best of knowledge have interpreted the probit and tobit results in the fashion that we do.

¹⁵ We have not been able to capture one important industry level variable – de-licensing. Out of the 18 industries that remained under licensing after the 1991 reforms, 12 were de-licensed at different stages in the next decade. It is difficult to capture these changes at the level of dis-aggregation for which data are available.

is a reasonable time frame for observing the industry characteristics by a potential entrant for her decision-making. Hence, all the explanatory variables are measured as simple three year averages with a one year starting lag from the year of entry. Appendix III provides the details of how different independent variables have been measured.

4. Determinants of Entry: Interpreting the Results of the empirical Investigations

The purpose of this section is to analyze the results obtained from the econometric exercises in order to get a deeper understanding of the determinants of entry. We begin with an analysis of the trends in different types and modes of entry in the 1990s. The broad patterns of entry in different industry groups are also explored here. This is followed by a detailed analysis of the results obtained from different models of entry that have been estimated. Finally, the key findings of our analysis are summarized.

4.1 Entry in the Indian Manufacturing Sector: Recent Trends and Patterns

The study was conducted for a period of seven years (1993-2000) and across 121 industry groups in the manufacturing sector in India. So we have 847 (121 industries x 7 years) data points. Each data point of the entry database records the number of entries that take place in that year in that particular industry. Trends and patterns of 'entry' can be analyzed by looking at different 'types of entrants' and 'modes of entry', over time and across industry groups. Table 1 provides a year wise break up of entries that have been recorded across different types of entry. The data shows that during the seven year period (1993-2000) a total of 3308 'entries' took place. Of these only around 11% were new players or new legal entities (373), and entry through expansion of existing players (71%) dominated the scene. Entry through diversification constituted about 17% of all entries. Interestingly, within the new legal entities, those promoted by groups not operating in the Indian market formed a significant majority (274 cases out of 373 i.e. 75% among 'new players' though overall only about 8%).

The estimates of entry over time suggest that 'extent of entry' was significant during the pre-1996 period, especially during the period 1994-96. It declined significantly in the subsequent period. The period 1993-95 saw a variety of policy changes that liberalized the Indian economy and made foreign

direct investments easier.¹⁶ This is reflected in the high extent of entry activities during the period 1993-96. The post 1995 period has seen a major industrial recession, drop in the GDP growth rate and political in-stability leading to a decline of general business confidence in the Indian economy. The entry statistics for the post 1996 period seems to reflect this scenario with a gradual fall starting from 1995. Interestingly, high extent of entry during 1993-96 and a fall thereafter is seen for all types of entry.

The distribution of entry categories by industry groups (Table 2) shows that basic industries like chemicals, textiles, machinery and food & beverages accounted for almost over 70% of the total number of 'entries' (all types considered together). This industrial distribution is more or less the same for all types of entry. A more detailed distribution of entry (Table 2) shows that industries like chemicals & plastics (26%), food products (11%), synthetic textiles (9%), ferrous metals (9%), electrical machinery (4%), electronics (5%) have been the major target industries for all types of entrants. While the industrial distribution of 'entry' is skewed in favour of certain industry groups, most industries were involved in some or the other entry activities. During 1994-97, out of 121 industries, almost 90% reported some type of entry activity. As was the case with 'extent', 'incidence' of entry across industries also fell drastically in the post 1997-98 period, the year 1999-2000 reporting 'entry' only in 49 out of 121 industry groups.¹⁷

The inter-temporal profile of 'entry' observed above is a reflection of two forces at work. The pre-1996 period, when entry was large, was the period when the bulk of the policy related restrictions on entry were withdrawn. It was also the period when the Indian economy was looking up. The major policy shift in 1991 led to an across the board de-licensing and repealing of Monopoly and Restrictive Trade Practices Act, and opening up of various sectors to FDI. The policies relating to FDI were further liberalized in 1993 and 1995. Similarly, policies relating to technology purchases were liberalized and sectors that were earlier reserved for the public sector were opened up for the private sector. De-licensing and deregulation on different fronts reduced or eliminated policy induced entry barriers in most industries. Besides, policy changes eased access to both capital and technology. A major policy focus has been on foreign direct investments (FDIs), financial markets, exchange rate policies and tax reforms. A host of industries were given automatic permission for up-to 51%, and 74% equity holding in the year 1995 (Rosario, 1999)¹⁸. The Indian securities market has been

¹⁶ See Basant (2000), Rosario (1999) and Saha (2001) for details of these policy changes.

¹⁷ For example in 1994, 110 out of 121 industries reported entry of one type or the other. To save space, these estimates are not reported here. They are available in Saha (2001) Table 4.4, p 70.

¹⁸ See Saha (2001) Appendix 4.1 for details.

opened to registered foreign institutional investors for investments. In addition, from September 1992 Indian companies were permitted to tap the Euro-market with instruments like GDRs, Yankee or high yielding bonds and Euro-convertible bonds. It was accompanied by lower corporate taxes, removal of quantitative restrictions on imports and the convertibility of rupee. In short, it ensured better efficiency in markets by subjecting the Indian manufacturing sector to both internal and external competition.

Financial sector reform has enhanced access to capital in the Indian and markets abroad. Besides, the maturing of capital markets implies that independent and new firms can raise capital more easily now than was the case earlier. Earlier, enterprises with access to the 'internal' capital markets of the group were better placed to make entry into profitable markets.

As many of the policy measures mentioned above were introduced in a phased manner even after the "big bang" in 1991, one would expect their impact to be staggered. It is difficult to empirically capture these staggered effects. However, overall, it is evident that significant liberalization of public policy in the early 1990s, and rapid growth of the Indian economy during 1993-96 facilitated entry during this period. A downturn in the Indian economy during the latter part of the 1990s, may have led to the general decline in the 'entry' activities during 1996-2000. While this general relationship between entry, policy liberalization and economic growth seems evident, industry specific effects of policy and growth on entry are difficult to specify for econometric estimation. We shall come back to this issue in a later part of this section.

4.2 Models of Entry: Interpretation of Results

The results of the various models specified in the last section will be discussed here. The discussion is broadly divided into three parts. We begin with an analysis of tobit estimates on the determinants of 'extent' of entry. It will be followed by an analysis of probit estimates on the determinants of 'incidence' of entry. Within each of the sub-sections, we will compare the determinants of different types of entry, defined earlier. The final sub-section will analyze if the determinants of entry are different for 'incidence' and 'extent' of entry.

4.2.1 Models of Extent of Entry: Results and Analysis

To identify the difference in the determinants of 'new' and 'diversifying' entry, three dimensions are looked at: a) direction of the relationship (positive or negative); b) significance of the relationship (level of significance of the coefficients); and c) extent of impact/influence (quasi-elasticity of the

variable coefficients). A negative and significant coefficient of a variable with a relatively high value of the quasi-elasticity would imply that the variable poses a significant entry barrier on the 'extent of entry'. Similarly, a positive significant variable coefficient would suggest an entry inducing impact.

The Base Model: Analyzing 'ALL' Types of Entry Together

Table 3 reports the estimates of various tobit models for different types/modes of entry. The results for the model where "all" types of entry is considered suggest that large industry size, high growth and high returns on capital induce entry significantly. A comparison of the values of the elasticity shows that the impact of industry size on entry is the largest, followed by returns on capital and growth of industry; the impact of the latter two factors is much smaller than that of the 'size' but is still quite significant.

High entry risk, capital intensity, concentration and large scale of operation raise barriers to entry. All these except risk factors, can be called structural factors i.e. capital intensity, concentration, and scale of operation. The elasticity estimates suggest that the largest negative impact is due to high scales of operation followed by concentration, capital intensity and entry risk. The insignificant impact of industry risk suggests that potential entrants are more worried about intra-industry variations in profitability rather than the inter-industry variations over time.

Determinants of Entry: New Player versus Existing Players

Given the general determinants of all types of entry combined together, do the factors influencing 'new', 'diversifying' and 'expanding' entry differ? It may be recalled that new entry is defined as the creation of new legal entities through Greenfield investments. We have argued earlier that many of these new legal entities may actually be promoted by existing players, even by prominent business houses or groups. In such a situation, new legal entities need to be seen as a diversified entry and not a new entry. It may be recalled that based on the information on promoters, new legal entities were divided into two groups: those promoted by existing players and 'others'. Admittedly, this classification may have certain measurement errors as information on promoters was somewhat incomplete. Besides, a new legal entity floated by a foreign promoter without any domestic equity partner gets classified into 'others' although it is a type of diversifying entry adding to measurement errors. That such errors will be significant is unlikely as 100 percent equity participation in most manufacturing sectors is only of recent origin and very few cases of this type may have taken place. Despite the problems of data, when 'new' players (legal entities) promoted by existing players are removed from the estimates (of total numbers of new players/entrants) and the new player model is

re-estimated, there are significant changes in the results. Table 3 reports these estimates as well. A comparison of the factors influencing the entry of different types of entrants throws up some interesting insights.

In general, industry size, its growth and profitability are important determinants of entry for all types of entry. While size of the industry is the most significant and important factor inducing entry of diversifying/expanding entrants, it has a positive but not a very significant influence for new entrants. Growth of industry attracts all types of entrants in a significant manner but the impact is marginally lower for the entities making entry through expansion. Similarly, returns on capital employed are important determinants of entry of all types but the impact is lower for the diversifying entrant.

Interestingly, high R&D intensity acts a barrier to entry only for the diversifying and the unaffiliated new entrant. High foreign technology purchase intensity of an industry seems to attract new and diversifying entrants in a significant manner; its role however in inducing incumbents to “enter” through expansion is positive but insignificant.¹⁹ However, high foreign technology intensity does not induce entry for unaffiliated new entrants. The fact that high foreign technology intensity ceases to be a significant entry inducing factor for new entry when only the unaffiliated entrants are considered suggests the existence of imperfections in the technology markets. Foreign technology based entry seems to be feasible for only those new firms that are promoted by existing entities through the new firm/diversification or expansion route; unaffiliated firms apparently are not able to adequately participate in this market. Interestingly, high R&D intensity also turns out to be a significant entry barrier for the unaffiliated new entrants, which was not the case when both types of new entrants were considered. As indigenous R&D and foreign technology as a source of entry may be substitute strategies in technology intensive sectors, inadequate access to foreign technology and high costs of R&D seems to be making entry in these sectors difficult for unaffiliated entrant. Others are able to use the strategy of making foreign technology based entry.

Industry concentration creates barriers for all types of entrants except for the new unaffiliated entrants. High levels of concentration as a barrier seem to be of common more for existing players than for new players. Existing players adding new product, floating a new legal entity (firm) or expanding capacity are deterred by high levels of concentration. This, however, is not the case for

¹⁹ Interestingly, more detailed results (not reported here) show that foreign technology intensity induces expansion through new unit, though it has no significant effect on capacity expansion. With the liberalization of foreign technology purchase regime and removal of restrictions on production capacity, existing players may have focused on building up new units as a way of expanding business and introducing technology to the firm.

unaffiliated entrants and for those who are diversifying across sectors. One interpretation of this result could be that diversifying entry is more concerned about oligopolistic interdependence/reactions and the associated rivalry than the new entrants.

Like high concentration high capital intensity also adversely affects entry in all cases except for diversifying entry in the case where all types of new legal entities are considered together.²⁰ High capital intensity was expected to be a significant barrier to entry for the 'unaffiliated' new entrants due to the capital market imperfections discussed in the last chapter. That capital intensity was not a barrier when both types of 'new' entrants were considered, suggests that capital market related barriers are not as important for 'new' firms promoted by existing players.²¹ High capital intensity is not a significant entry barrier in all cases. It does not adversely affect the entry decisions of existing players who plan to diversify into a new product group or a new sector. It also does not deter existing players to float new firms. However, it does create a barrier for new firms not promoted by existing players and for those existing firms who wish to add capacity through a new unit. If capital intensity based entry barriers are seen as a reflection of capital market imperfections, only some of these results seem plausible. One should expect these imperfections to be less severe for existing players than for unaffiliated new entrants. The estimates broadly reflect this tendency. But significance of such barriers for expansion needs to be explored further.

Surprisingly, high scales of operation (minimum efficient scale) adversely affect the 'entry' of only those who are diversifying or expanding production. This may partly be due to certain characteristics of existing players and new entrants. The existing players may be close to efficient scales of operation not requiring any kind of expansion and access to capital may not be as severe a problem for some new entrants. We shall revert to this issue later.²² High levels of vertical integration significantly deter new entrants and diversifying entrants and not the entities undertaking expansion. This is expected because many of the existing players may already be vertically integrated entities

²⁰ As expected, high capital intensity deters expansion through 'new unit', though its effect on expansion through 'capacity' expansion is not significant. This is probably so because capital requirements to build a new unit are larger compared to expansion in capacity. These estimates are not reported here (see Saha, 2001, Chapter 4).

²¹ Unfortunately, we could not test this hypothesis directly as the tobit model with only new legal entities promoted by existing players as the dependent variable, did not converge.

²² There can also be a problem with interpretation for capital intensity and MES variables. The post-96 recession would show up as a reduction in MES and increase in capital intensity as we have measured them. If firm exit is sticky, which is likely to be the case, denominators of the two expressions do not fall as much as the numerators in a downswing, but rise along with them in an upswing. We are thankful to Aditya Bhattacharjee for pointing this out to us. It is difficult to predict the biases this problem can create in our estimates.

and may not face the same constraints as a new/diversifying player might.²³

High entry risk seems to be a significant entry deterrent for diversifying and expanding entrants and not for the others. Apparently, new entrants (unlike the existing ones) do not consider intra-industry variability in profitability to be a very important factor affecting the chances of making profits in that industry. High industry risk, on the other hand, has a negative impact on all types of entry but does not deter entry in any significant manner, except in cases of diversifying entry.

High export orientation of an industry deters only expanding entrants and not others. In fact, extent of new entrants is positively affected by export orientation although the relationship is statistically insignificant. It is difficult to interpret this result. One possible explanation is that existing entities making the same product are not sure about fulfilling the high quality and other requirements of an export oriented sector, given their existing facilities and capabilities. And some of the new entrants making those products for the first time are more confident in this regard. On average, the existing manufacturing entities do not want to add new products or expand in those industries where export orientation is high.

Advertising intensity has a negative relationship with all types of entry although the relationship is not statistically significant. Levels of distribution and marketing intensity do not show a consistent relationship (in terms of direction) with different types of entry. In our case, it does not have a significant impact on any type of entry. This is surprising as we expected such complementary assets to create significant entry barriers. It is likely that these barriers are important in selected sectors and may not show up in such aggregate unit of industry analysis.

Overall, factors that raise barriers to entry are capital intensity, industry concentration, minimum efficient scale of operation, entry risk and vertical integration. Factors that seem to induce entry of firms are industry growth, returns on capital, and industry size.

²³ High levels of vertical integration deter creation of a new unit but not expansion of the existing plant, which is expected (see Saha, 2001, Chapter 4).

4.2.2 *Models of Incidence of Entry: Results and Analysis*

Table 4 provides the estimated results of the probit models. The results show that large size of the industry, high growth high returns on capital and high levels of vertical integration induce incidence of entry significantly. A comparison of the values of the elasticity shows that the impact of industry size in enhancing the possibility of entry is the largest followed by industry growth and returns; the impact of the other factors is much smaller than that of the 'size' in enhancing the possibility of entry. Capital intensity and scale of operation raise barriers to entry. A comparison of the elasticities suggests that the impact of scale of operation as a deterrent for the incidence is much larger than that of capital intensity.

Incidence of Entry: New Player versus Existing Player

As in the case of the extent of entry, industry size, growth and returns increase the probability of entry for all types of entrants significantly, but there are important differences. For example, the impact of industry size on the probability of entry is much larger for the new entrants, especially the unaffiliated ones. Apparently, some of the new entrants are able to exploit the market opportunity emanating from large size of the market quite effectively. Similarly, while the growth of industry also increases the possibility of entry of all types of entrants in a significant manner, its impact is marginally higher for the diversifying players. Returns on capital employed are important determinants of entry of all types of entrants, except diversifying ones, though the impact is somewhat larger for the new entrants.

Surprisingly, capital intensity reduces the possibility of incidence of entry only through expansion; it has no significant entry deterring effect on new entrants. Moreover, high levels of vertical integration seem to positively affect incidence of entry although the impact is significant only when all entrants are considered together.²⁴ However, large scales of operation deter the possibility of entry significantly for all types of entrants though the impact is much larger for the new entrants.

Export orientation does not have a significant effect on the incidence of any type of entry but surprisingly while it has a negative impact on the entry by existing players, it has a positive impact on the of incidence new player entry.

²⁴ Detailed estimates show that incidence of entry through capacity expansion is enhanced with higher levels of vertical integration. In a sense it highlights that firms already operating in a vertically integrated environment are facilitated in further expansion of capacity.

R&D intensity reduces the possibility of entry for only new entrants significantly, which was expected. Detailed analysis of the two types of new entrants shows that foreign technology purchase intensity enhances the possibility of entry of only the new entrants who are promoted by existing players possibly highlighting the existence of technology market imperfections.²⁵ Technological opportunities cannot be exploited by all types of entrants.

High concentration in an industry enhances the possibility of incidence of new entrants who are not promoted by any existing player. Possibly a few of the better endowed new entrants in their class are targeting concentrated industries which may be inefficient as an outcome of earlier days of regulation.

Some of the new entrants seem to be risk prone as higher variations in profitability of firms in an industry, capturing the *entrepreneurial risk*, enhances the possibility of incidence of new entrants significantly though it has no significant impact on the existing players. However, when the new players are analyzed separately as - unaffiliated and affiliated, entry risk has no significant effect. Industry risk also does not have any impact on incidence of entry. However, detailed estimates show that diversifying non-manufacturing firms' possibility of entry is enhanced with higher variations in profitability across firms in an industry (*entry risk*), though the possibility of entry is reduced with higher variations in profitability of an industry over a period of time (*industry risk*). It may be inferred that the better endowed diversifying non-manufacturing²⁶ firms are ready to take the risk of operating in an industry where performance of firms are varying, possibly viewing that as an opportunity.²⁷

Advertising intensity deters the possibility of incidence of new entrants significantly though it has no significant impact on the existing players, which is expected. Distribution and marketing intensity of an industry does not affect the incidence of any type of entry. However, detailed estimates (see Saha, Appendix Table 4.2) show that it enhances the possibility of entry of non-manufacturing firms diversifying into manufacturing sector. In non-manufacturing sector businesses like services and

²⁵ Furthermore, it is interesting to note that high R&D intensity reduces the possibility of expansion of capacity though it has no significant effect on expansion through new unit. During the licensing era with constraints on capacity of production, firms have built their plants with the technologies that were available at that point in time. Expansion of older plants with obsolete technologies does not make sense in technology intensive sectors. For details estimates of the probit models, see Saha (2001) Appendix Table 4.2.

²⁶ In our study we recorded 170 entry of non-manufacturing sector firms entering the manufacturing sector. Surprisingly out of these 170 it was observed that 139 of them belong to services sector.

²⁷ High industry risk significantly reduces the possibility of expansion by a new unit only. This highlights the fact that firms are averse to expand their operation by building any new unit in an industry, which has large variations in profitability over a period of time (Saha, 2001, Appendix Table 2).

merchandising agents, distribution channels and marketing skills play a very important role in business development. Players who have those skill-sets and are now diversifying into the manufacturing sector have a higher possibility of entry as they are able to leverage them.

Overall most of the results are plausible. The results highlight the fact that heterogeneity among the entrants needs to be addressed while addressing the issue of entry determinants. Some of the new entrants may be well endowed leading to overcoming the entry barrier. For example capital intensity, which has no significant effect on incidence of new entrants, may be because some of the new entrants are well endowed and are able to overcome the barrier. A few other variables that were expected to act as barriers to entry have a negative relationship with different types of entry although the relationship is not statistically significant.

4.3 Determinants of Extent and Incidence of entry: A Comparative Analysis

It may be recalled that the logic of analyzing the two scenarios was to explore the idea of heterogeneity among entrants, the well-endowed ones at the top of the queue of potential entrants v/s the less endowed ones at the back. Since quasi-elasticities based on PROBIT and TOBIT estimates are not comparable, we can only compare the significance and direction of the relationship.

4.3.1 Structural Factors

The estimates suggest that large size of the industry increases the probability (incidence) of entry of all types but has a significant positive impact on the extent of entry through diversification into a new product and expansion. Thus, while the probability of new player's entry increases with industry size, the extent (number of such entrants) is not significantly affected.²⁸ This may imply that only a few potential entrants are able to respond to opportunities provided by large market size, an indication of the heterogeneity among potential entrants²⁹.

While industry concentration generally adversely affected the extent of entry of all types (including new players), it improves the probability of entry of unaffiliated entrants. In fact, it has a positive but insignificant impact on the probability of entry of all types.³⁰ . Our estimates, therefore, show that high concentration in an industry attracts a few unaffiliated new players, but it erects barriers for the extent of new players' entry. Apparently, the better-endowed entrants among different categories are attracted to more concentrated industries, in search for higher profitability in the future.

²⁸ The same was found to be true of diversification into a new sector. Detailed estimates are not presented here.

²⁹ The other possibility is the non-linearity in the relationship between market size and extent of entry. This has not been explored, partly due to some multi-collinearity problems.

³⁰ More detailed estimates show that and the probability entry of those non-manufacturing firms that are diversifying into manufacturing is also positively affected by concentration levels.

High capital intensity significantly reduced extent of entry by unaffiliated entrants and through capacity expansion. However, it adversely affected the probability of only those entrants who are diversifying into manufacturing from other sectors. The impact of capital intensity on new sector diversification is somewhat difficult to interpret. It is clear, however, that for some well endowed unaffiliated entrants, high capital intensity is not an entry barrier, but for most others it is. As discussed, capital intensity raises barriers on account of i) sunk costs associated with capital investments and ii) capital market inefficiencies reflecting higher or preferential interest rates and basic non-availability of capital. The results of our study show that such barriers are significant for unaffiliated new players and for players trying to diversify into a new product group.

The situation is somewhat similar in the case of vertical integration. High levels of vertical integration significantly reduced the extent of entry for almost all types of entrants. Given the fact that, overall, high levels of vertical integration seem to increase the probability (incidence) of entry, (especially for those who are expanding capacities), one can argue that integration related entry barriers are not relevant for all entrants. Those which are already vertically integrated entities can expand or diversify into related products. Moreover, among new entrants and those diversifying into new sectors there may be some, who have the wherewithal to make a 'vertically integrated' entry. Once again, the heterogeneity among the potential entrant gets sharply reflected in the estimates.

Industries may be structurally characterized by high vertical integration as natural to the production process. Alternatively, firms build up strategic backward and forward linkages to increase efficiencies arising out of lowering of transaction and other costs while operating in various segments of the production chain. In such a scenario, entrants need to develop such linkages to compete with an incumbent with competitive advantages arising out of cost efficiencies. Inability to make a vertically integrated entry reduces extent of entry. It was observed that vertical integration raises barriers to entry for new players whereas facilitates entry through capacity expansion of existing players. The former result may both be the outcome of structural characteristics of the industry being vertically integrated or of strategic initiatives of existing players to create vertically integrated entities. The fact that existing player's activities are being facilitated by high levels of vertical integration makes sense, as existing players may already have strategically or otherwise built up backward and forward linkages. It is to be looked into whether such levels of vertical integration and related barriers are built up efficiently/strategically or part of the inefficiencies embedded into the industrial structure arising out of preferential licensing during the license 'raj'.

Contrary to expectations, similar conclusions cannot be drawn on the basis of the estimates of the minimum efficient scale. High MES reduces the probability of entry of all types and as expected the largest negative impact is on the probability of entry of the unaffiliated new entrant followed by those who are diversifying into a new sector. In general, similar relationship holds in the case of extent of entry, although it is not significant in some cases.

Overall, it emerges from the comparison, that while several structural barriers to entry are relevant for the extent (number of entrants) of entry but not for the incidence (probability) of entry. This implies that there are always some 'potential' entrants who have the ability to overcome these barriers.

4.3.2 Conduct Related Factors

Advertising intensity can facilitate entry through information provision about new players and products or deter it through brand loyalty, scale economies in advertising and so on. Advertising intensity did not influence extent of entry in any significant manner, although the coefficient was negative for all types of entry. The probit estimates also show that the relationship between incidence of entry and advertising intensity is negative though insignificant in all cases of entry except one; the probability of new player entry is significantly reduced with the increase in advertising intensity. This suggests that at the margin product differentiation can be a significant entry barrier for new players. But contrary to expectations, the adverse impact is not significant in the case of extent of entry.

Advertising intensity varies significantly across industry groups. For example, consumer non-durable and to some extent durable are the industries where advertising intensity is relatively high. The need for product differentiation to maintain competitive edge also differs across industries and within the same industry it gets enhanced with the maturity of the products, consumers and the market as a whole. Given the fact that many industries are not advertising intensive partly due to industry specificity and relatively nascent stage of the Indian markets, advertising intensity may not emerge as a 'general' barrier to entry across industry groups, everything else being the same. As far as the adverse implications of high advertising intensity on new player entry is concerned, it was expected that the type of barriers discussed above would be more relevant for a new player than for an existing player.

The case of distribution and marketing intensity is somewhat different. It does not have any significant influence on the extent and incidence of entry of any type. The only exception is the incidence of entry by non-manufacturing enterprises into manufacturing; the relationship is positive and significant. Apparently, a few of the services sector enterprises are able to leverage their complementary assets relating to marketing and distribution to enter into the manufacturing sector which requires access to such assets. This, once again suggests some heterogeneity among potential entrants from non-manufacturing and manufacturing sector in terms of access to complementary assets like marketing and distribution. The argument vis-à-vis advertising can be extended here to suggest that requirement of such complementary assets has not yet emerged as a significant barrier to entry across different types of industry groups, other factors remain more important. These complementary assets may however, continue to be significant for specific industry groups. The observation that only the probability of entry through diversification into a new sector was positively induced by distribution and marketing intensity is interesting. Apparently, the non-manufacturing sector firms, which are entering the manufacturing sector are at the margin, focusing on those sectors where such complementary assets are important and where their existing marketing and distribution capabilities can be leveraged.

High R&D intensity reduces the probability of entry of new players. The extent of entry was also adversely affected for the new unaffiliated players and for the diversifying entrants. This seems to imply that high R&D intensity creates a knowledge entry barrier for the new entrants, especially those, which are not affiliated to any existing entity which even the better endowed among them are not able to overcome. The probability and extent of entry by existing players creating a new firm increases with foreign technology intensity in an industry. But there does not seem to be any significant difference between potential entrants in each category vis-à-vis their ability to make foreign technology based entry.

Investments in R&D involve endogenous sunk costs as R&D entails heavy capital investments whose returns are expected in the long term through development of new products, processes and practices, thereby creating knowledge based barriers to entry. High R&D expenditures may be part of the basic characteristics for technology intensive industries, but R&D intensity may also be raised strategically by companies mainly with sound financial strength. Our results show that R&D activity can raise barriers for new players and for existing players who wish to diversify into new products. Apparently, heavy capital investments and sunk costs associated with R&D deter new players from entering and even reduce the probability of entry through diversification in new products. It is

obvious that capital market imperfections raising cost of capital for such players or reducing availability can exacerbate the R&D based entry barriers.

Since the liberalization of the technology regime post 1995, the government policy has improved access to foreign technology. Consequently, barriers to foreign technology based entry have been reduced. However, purchase of foreign technology can also involve high capital investments like R&D investments. But the uncertainty is somewhat less as the technology may have been used elsewhere which helps in making decisions about investments in foreign technology, as compared to investing in R&D where the outcome is relatively unsure. The results show that policy induced reduction in the technology market imperfections seems to have improved access to foreign technology for existing players only; the new players are still constrained to use this mode of entry.

4.3.3 Performance Related Factors

Growth of industry also increases the incidence and extent of entry of virtually all types. Entry can be perceived as an investment decision with returns expected on a long-term horizon. The decision to invest capital is taken after analyzing the opportunity costs related to it. Performance of an industry is the main driver in decision making while analyzing business opportunities and investment decisions. It is observed that high returns on capital employed induced the probability (incidence) and extent for all types of entrants.

Industries vary in terms of scales of operation at which firms can operate efficiently. This mainly depends on the fixed cost component of the investment. Hence industries with high fixed costs are expected to have larger efficient scale of operation. If large scales of operation are 'natural' to an industry, nothing much can be done about the associated barriers to entry, except that emergence of new technologies can change the cost structure and may change the efficient scale of operation. Given costs and size of the industry, our data shows that high minimum efficient scales (MES) raise barriers to entry for all types of entrants. Unless the markets are contestable, removal of such natural barriers is possible only through development/introduction of new cost-effective technology requiring smaller scales of operation.

The influence of risk related factors is interesting. In general, entry risk has significant negative impact on the extent of all types of entry except in the case of new players and those who are diversifying into a new sector. Even in these two cases, the relationship is negative though not significant. As far as the probability of entry is concerned, it is negative and significantly related to

entry only for those existing firms who are diversifying into a new product. The probability of new player entry and diversification into a new sector is actually increased by high entry risk. The relationship with the incidence of entry of other types is insignificant. This suggests that among the potential new entrants and non-manufacturing entities exploring to enter into manufacturing, there are players that are risk prone, willing to enter an industry where the inter-firm variability in profitability is high. Risk proneness once again distinguishes among potential entrants and points to the heterogeneity among them. Some of these firms are either risk prone or have the ability to take risks.

Industry risk affects the probability and extent of entry of all those entrants who are entering through diversification but not for other entrants. The relationship between industry risk and incidence of different types of entrants is not significant. The only interesting thing that emerges from the comparison is that industry risk has a negative impact on the extent of all types of entry (although not always significant), it has a weak but positive link with probability of entry by an unaffiliated new entrant. This once again points to heterogeneity in terms of the ability to take risk by potential new players on their risk proneness.

Broadly, the results suggest that entry risk is a more important factor than industry risk. Industry risk measures the risk arising from variability of performance of the industry over time and entry risk measures the risk from the entrepreneurial point of view arising from variations in performance across firms within an industry. In general, entry risk deters entry, but some new players are risk takers making the incidence of entry positively linked to such risk. The post 1991 period experienced denationalization and significant deregulation. Potential entrants could have seen opportunities in sectors hitherto reserved for the public sector, where variations of performance across firms was high due to inefficient management practices of public sector enterprises. In order to tap the potential of a market earlier catered through an inefficient operator and now opened to private participation, new players may have opted to venture in. But what one has also observed is that the Indian economy performed badly during the period mid 1996 to late 1999. May be the outcome of that is reflected in existing firms declining to operate in industries with high industry risk as evident from the analysis. The results also show that existing players are risk averse from the point of industry and entry risk, both for diversification and expansion.

5. Some Concluding Observations

The results of the study show that it makes analytical and empirical sense to distinguish different types and modes of entry as determinants of entry may differ across categories of entrants. Entry involves capital investments and risks related to it. This is so whether investments are for building a plant, brands, distribution channels or R&D to penetrate new markets. Efficient capital markets that enhance availability of capital, reduce costs of capital and do not discriminate across players helps in lowering the barriers to entry and build up the platform for a competitive environment. A variety of structural and strategic determinants have been explored in this study.

5.1 *Some Policy Implications*

Entry is an investment decision and efficiencies of the capital market play a major role in facilitating the process. The goal of a policy maker should be to ensure availability of capital, lower capital costs and create an efficient system of project evaluation that is in short, an efficient capital market. The outcome of embedded inefficiencies in our capital markets result in a slack in competitive environment as the whole process of entry requires capital and that is what it is starved off. On the technology front, though a liberal technology regime has allowed purchase of foreign technology but it is of limited use. This is so because, emerging new technologies are costlier and often require significant initial investments. The gains are in terms of lower long-run costs and better product quality which may enable domestic players attain international standards for competing in foreign markets. But if the Indian industry continues to be plagued by capital availability constraints and related imperfections, competition with global standards and efficient cost structures may not be achieved. The results of the study show that these constraints can adversely influence entry in a variety of ways and therefore should be a major policy focus to enhance contestability in Indian manufacturing markets.

The other aspect the policy makers need to look at is more of a 'policing' role – the competition policy. It has been discussed in literature that large domestic firms and MNCs have the tendency of controlling the market. Industries where such activities are predominant globally are consumer goods industries, certain basic goods like cement and in some cases services sectors like banks. Overall, the government should carefully follow the industry 'concentration' characteristics in order to avoid anti-competitive practices. Certain industries have been found to be traditionally vertically integrated as it helps in internalizing the value in the production chain i.e. positive production externalities and in some cases reduction in transaction costs resulting in reduction of negative externalities. The role of the government is limited in such traditional industries. But if certain firms strategically build up such

vertical integration to make non-vertically integrated firms at a cost disadvantage and gains control over the market, the government needs to take strict pro-competitive policy actions in such cases.

Moreover, a continued focus on conduct through competition policy is desirable given some interesting evidence elsewhere (Geroski, 1995). Entry is slow to respond to profitability. While entry barriers may not be “high” enough to deter entry, they often adversely affect post entry performance and can result in exit of “new” firms. Thus, as Geroski (1995) correctly argues, entry can be a poor substitute for active rivalry among incumbents in market and the policy needs to maintain an active focus on that.

Lastly growth oriented policies will result in higher extent/incidence of entry. This will create dynamism in the economy and also a competitive environment. One can argue that lower capital costs that induce new investments may also enhance the growth prospects.

5.2 Some Limitations

In terms of methodology, the contribution of this study has been the classification of entry categories. The types of entrants and their mode of entry defined in the study capture heterogeneity among entrants. However due to paucity of data entrants were not classified further on the basis of foreign or domestic ownership. Ideally one should have explored if determinants of entry vary for domestic and foreign entrants. This is particularly relevant during post 1991 period, when the Indian economy was opened to foreign participation and domestic firms have repeatedly complained about the existence of a non-level playing field.

Furthermore, the study considered only Greenfield projects for the classification of different types of entry. Mergers, acquisitions, and takeovers have been important modes of entry in India especially during the post 1993 period when competition and FDI laws were liberalized. A comparison of our results with those on the determinants of entry through mergers and acquisition activities can provide useful insights. While such comparison would be useful, a focus on Greenfield investments is useful insofar as entry by this route would have more effect on competition than M&A based entry.

Entry through diversification has been captured in this research by the introduction of new products. A further classification into related and un-related diversification would have been analytically more

useful. Another limitation arises from the non-availability of data on the 'size of the investments' in the projects concerned; the study does not distinguish between different levels of investments. After all 'entry', as argued earlier, entails an investment decision. From an investment perspective, if one studies the determinants of entry, we can get more insights into the factors determining entry, specifically the role to be played by the capital markets, if one incorporates the size of investments involved.

The other set of limitations arises from the measurements of the explanatory variables. Many of them have been identified earlier. In addition, operating with excess capacity has been identified in the literature as a strategic move by firms. Theoretically excess capacity provides a credible threat to a potential entrant who fears that the incumbent may flush the market with large supplies as he enters the market resulting in excess supply and decline in prices. If the prices fall below average costs of operation, only a financially strong firm may sustain the losses resulting. In such a context, capacity utilization of the industry gives a good measure to capture such strategic moves. This has not been included in the study because of non-availability of data. The other major variable, which has not been captured because of non-availability of data, is that of import competition. We have been able to capture the export orientation of the industries and its impact on the determinants of entry as it provides larger opportunity for Indian players. At the same time one also needs to capture the effect of import competition on the incidence and extent of entry.

This study uses panel data on 121 industries for seven years. In this framework, it is important to control for omitted industry specific variables that are constant across time. Assuming that the industry specific effects are fixed, these can be controlled by introducing industry dummies. Since the number of industries included in this study is very large, this method would have resulted in a loss of significant degrees of freedom and was thus avoided³¹. The second way is to treat the industry effects as random, which leads to random effects model. An attempt was made to control for industry effects in the random effects framework but both Tobit and Probit models failed to converge in this case. Due to these computational difficulties, the industry specific effects could not be controlled for. That remains one of the limitations of the study.

³¹ Another way to control for fixed industry effects is to transform the model into deviations form by taking the deviations from time mean for each industry group. Due to the censoring in the dependent variable however this method introduces additional complications in the estimation procedure. That is because the distribution of the transformed dependent variable is no longer censored at zero. The mass of the dependent variable, which was concentrated at zero, gets distributed over several points making the distribution of the transformed dependent variable relatively complex.

5.3 Issues for Further Research

Having identified the gaps in this research, following it up specifically on the entry classification front – foreign and domestic ownership, mergers and acquisitions will enrich the scope of the study. Similarly by incorporating the data on import competition and capacity utilization one can control on two important aspects of strategic behavior of firms. Another important are of extending this research can be to incorporate the role of firm specific factors in deterring entry. Given the industry characteristics, in which entry is taking place, additional firm level information will help in identifying the variables that influence the choice of the mode of entry. Thus, in this conceptualization mode of entry will depend on two sets of variables – firm specific and industry specific characteristics. Such an exercise will give valuable inputs for firm level strategies.

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Table 1: Percentage Distribution of Entry in the Indian Manufacturing Sector by Types of Entrants and Year

Year	All Types	New Legal Entity		Diversification	Expansion
		Total	Affiliated		
1993-94	234 (7.1)	20.9	7.3	23.1	56.0
1994-95	952 (28.8)	12.4	3.5	14.7	72.9
1995-96	831 (25.1)	13.5	3.6	20.6	65.9
1996-97	568 (17.2)	11.6	1.6	21.0	67.4
1997-98	387 (11.7)	5.4	1.8	11.9	82.7
1998-99	218 (6.6)	3.2	1.4	10.6	86.2
1999-00	118 (3.6)	0.0	0.0	16.9	83.1
Total	3308 (100.0)	11.3	3.0	17.3	71.4

Note: Figures in parentheses in the second column report the share (percentage) of entrants in each year to total entrants during the period 1993-2000. Percentages reported in columns 4-8 are the share of each type of entry to total entries in the year (column 2).

Table 2: Percentage Distribution of Entry in the Indian Manufacturing Sector by Industry Groups and Types of Entry, 1993 - 2000

Industry Group	All Types	New Legal Entry			Diversification	Expansion
		Total	Affiliated	Unaffiliated		
Food & Beverages	400 (12.1)	22.3	5.3	17.0	21.3	56.5
Cotton Textiles	300 (9.1)	11.7	3.0	8.7	12.0	76.3
Synthetic Textiles	116 (3.5)	6.0	1.7	4.3	18.1	75.2
Other textiles	188 (5.7)	15.4	3.2	12.2	23.9	60.1
Chemicals & Plastics	862 (26.1)	10.4	3.1	7.3	18.4	71.1
Petroleum products	54 (1.6)	0.0	0.0	0.0	11.1	88.9
Rubber & Rubber products	48 (1.5)	12.5	2.1	10.4	4.2	83.3
Cement	98 (3.0)	8.2	1.0	7.2	10.2	81.6
Other non-metallic mineral products	156 (4.7)	11.5	3.8	7.7	14.7	73.7
Ferrous Metals	313 (9.5)	7.7	4.2	3.5	16.0	76.4
Non-Ferrous metals	54 (1.6)	7.4	1.9	5.6	18.5	74.1
Non-electrical machinery	96 (2.9)	5.2	0.0	5.2	16.7	78.1
Electrical machinery	148 (4.5)	6.1	2.7	3.4	14.2	79.7
Electronics	181 (5.5)	12.7	2.8	9.9	23.2	65.2
Transport equipment	124 (3.7)	3.2	1.6	1.6	10.5	86.3
Miscellaneous	170 (5.1)	12.9	0.6	12.4	20.0	67.1
Total	3308 (100.0)	11.3	3.0	8.3	17.3	71.4

Note: Figures in parentheses in the second column report the share (percentage) of entrants in each year to total entrants during the period 1993-2000. Percentages reported in columns 4-8 are the share of each type of entry to total entries in the year (column 2).

Table 3: Determinants of Extent of Entry - Tobit Estimates

Explanatory Variables	Dependent variable Extent of entry by type (Elasticity estimates)			
	All Entrants	New legal entry (all)	Unaffiliated new legal entry	Diversification Expansion
Advertising intensity	-0.03 (0.35)	-0.04 (0.43)	-0.02 (0.73)	-0.03 (0.25)
Capital intensity	-0.17 (0.00)	-0.20 (0.49)	-0.21 (0.00)	-0.18 (0.00)
Industry concentration	-0.20 (0.01)	-0.26 (0.00)	-0.18 (0.19)	-0.22 (0.02)
Distribution and marketing intensity	+0.00 (1.00)	-0.10 (0.98)	-0.07 (0.97)	+0.00 (1.00)
Export orientation	-0.06 (0.11)	+0.01 (0.84)	+0.01 (0.87)	-0.04 (0.40)
Industry growth	+0.07 (0.00)	+0.09 (0.00)	+0.08 (0.00)	+0.11 (0.00)
Minimum efficient scale	-2.97 (0.00)	-3.54 (0.24)	-3.88 (0.32)	-3.05 (0.07)
Returns on capital employed	+.0.39 (0.00)	+0.37 (0.00)	+0.39 (0.08)	+0.24 (0.08)
R&D intensity	-0.02 (0.46)	-0.11 (0.24)	-0.09 (0.00)	-0.04 (0.02)
Entry risk	-1.28 (0.00)	-0.50 (0.26)	-0.79 (0.19)	-1.23 (0.03)
Industry risk	-0.03 (0.43)	-0.01 (0.77)	-0.02 (0.67)	-0.13 (0.10)
Industry size	+4.78 (0.00)	+3.26 (0.12)	+3.63 (0.26)	+4.12 (0.01)
Foreign technology	+0.03 (0.26)	+0.06 (0.05)	+0.02 (0.53)	+0.06 (0.07)
Purchase intensity				
Vertical integration	-0.15 (0.14)	-0.15 (0.00)	-0.12 (0.01)	-0.14 (0.03)
χ^2	1148.52	1179.32	1029.94	1023.44
p	0.00	0.00	0.00	0.00
p ²	0.203	0.459	0.483	0.351
				-0.16 (0.12)
				1208.61
				0.00
				0.234

- Figures in parentheses provide the levels of significance for the elasticity estimates.
- Estimates that are significant at less than 10 percent have been indicated in bold.

Table 4: Determinants of Incidence of Entry - Probit Estimates

Explanatory Variables	Dependent variables Incidence of entry by type Elasticity estimates			
	All	New legal entry (all)	Unaffiliated new legal entry	Diversification Expansion
Advertising intensity	-0.00 (0.80)	-0.08 (0.08)	-0.07 (0.17)	-0.04 (0.20)
Capital intensity	-0.09 (0.03)	-0.06 (0.57)	-0.07 (0.53)	-0.13 (0.19)
Industry concentration	-0.04 (0.44)	+0.23 (0.18)	+0.34 (0.06)	+0.19 (0.15)
Distribution and marketing intensity	-0.01 (0.85)	-0.03 (0.81)	-0.00 (0.97)	+0.00 (0.97)
Export orientation	-0.02 (0.27)	+0.04 (0.36)	+0.04 (0.45)	-0.07 (0.14)
Industry growth	+0.18 (0.00)	+0.11 (0.02)	+0.11 (0.03)	+0.27 (0.00)
Minimum efficient scale	-0.75 (0.00)	-3.98 (0.00)	-4.71 (0.00)	-2.92 (0.00)
Returns on capital employed	+0.14 (0.01)	+0.42 (0.01)	+0.47 (0.01)	+0.21 (0.14)
R&D intensity	-0.02 (0.27)	-0.21 (0.00)	-0.20 (0.00)	-0.04 (0.21)
Entry risk	-0.12 (0.22)	+0.65 (0.04)	+0.48 (0.19)	-0.19 (0.47)
Industry risk	-0.00 (0.87)	+0.01 (0.92)	+0.01 (0.90)	-0.04 (0.42)
Industry size	+1.83 (0.00)	+6.01 (0.00)	+7.09 (0.00)	+5.81 (0.00)
Foreign technology	+0.01 (0.69)	+0.06 (0.13)	+0.02 (0.65)	+0.04 (0.25)
Purchase intensity				
Vertical integration	+0.13 (0.08)	+0.10 (0.63)	+0.10 (0.66)	+0.13 (0.48)
χ^2	123.72	132.69	134.38	136.19
p	0.00	0.00	0.00	0.00
Percentage predicted correctly	74.4	77.5	82.0	72.05
				68.40

1. Figures in parentheses provide the levels of significance for the elasticity estimates.

2. Estimates that are significant at less than 10 percent have been indicated in bold.

Appendix I

Sources of Data and Data Structure

To study entry barriers for the Indian manufacturing sector by using the “direct approach” the need is to get data on entry of firms at the industry level. Structured data on ‘entry of firms’ for each industry is not readily available in India. Consequently, for our research purposes ‘CapEx’ module of the Centre for Monitoring Indian Economy (CMIE) database had to be utilized to derive various measures of entry. The ‘Prowess’ module of CMIE database has been used for the measurement of the independent variables at the industry level. Data has been collected from the CapEx module of CMIE’s database for the period April 1993 to March 2000 and for the period April 1988 to March 2000 from the Prowess module of the database.

The CapEx module of CMIE database reports the details of projects completed. They track projects at different stages like the proposal stage, work in progress, completion or cancellation of the project. We have used the data on projects completed and their details to generate measures of entry. Whenever a project is completed, CapEx module of the database of CMIE reports the date of completion, the industry in which the project got completed, the product details of the project and the type of project (they classify the type of project into new unit and expansion). New unit involves an activity in which a new plant is being built, whereas capacity expansion involves activities related to an existing plant. Details of the product to be produced, along with firm’s name, are also given in the case of new unit and capacity expansion. From this detailed data on project completion, the entry database has been developed. The completion date and the industry in which the project got completed are accordingly considered as ‘entry date’ and ‘entry industry’. CMIE classifies industry into four major groups: manufacturing, services, mining and electricity. This research focuses on the analysis of entry barriers related to the manufacturing sector, as classified by CMIE. The manufacturing sector as per CMIE comprises of 121 industry groups³². Accordingly, in this study the determinants of entry of the manufacturing sector classified into these 121 industry groups of the manufacturing sector has been analyzed. The entry database compiled by us relates to the period 1993-2000. Data on industry characteristics like sales, advertising, and profits etc. has also been taken from the CMIE. The PROWESS module of the CMIE database is used for this purpose. Data for the 121 industry groups has been collected for the period April 1988 to March 2000. These have been used for the measurement of independent variables.

Each data point comprising the project completion details from the CapEx module of CMIE data base has been classified taking into consideration the types of entry defined in the text. The first step involves classifying the entrant into a “New Player” in the market or an “Existing Player”. If the firm (the new legal entity) had never ever operated before in any sector (manufacturing, services, mining, or electricity) prior to completion of this project, it was classified as a “New Player” in the market. Further, it was checked whether the new legal entity has been promoted by an existing business enterprise/house/group or it was without any parentage. In a strict sense, a new legal entity created by an existing enterprise can also be viewed as diversification.

We shall revert to this issue later. In order to check the ownership details, the Prowess module of the database of CMIE was used. In the second step, if clarified that the activity was that of an existing player, it was further classified whether it is an existing player from the manufacturing sector or from the non-manufacturing sector. If from the non-manufacturing sector it was classified as entry by diversification from non-manufacturing to manufacturing. If the project belonged to an “existing player operating in the manufacturing sector” then the particular *firm’s historical product profile* data was checked and if the product planned to be produced in the new unit is a new one compared to its earlier product portfolio it was classified as diversification into a new product by an existing manufacturing entity. Else the entry belonged to one of the expansion categories. The above exercise was done for 3308 manufacturing sector projects completed during 1993-2000.

³² See Saha (2001), Appendix 3.1 for a detailed listing of the 121 industry groups.

Appendix II Methods of Estimation

This study analyzes two measures of entry – extent and incidence. This section presents the econometric methodology used for estimating the empirical models.

Extent of Entry

Extent of entry (Y_{it}) is defined as the total number of entries in i^{th} industry in t^{th} time period. Since, however, there were no entries in a large number of cases, the dependent variable is censored at zero. To avoid censoring bias, this model is estimated using the Tobit procedure.

The Tobit model is usually presented in terms of an index or latent variable. More specifically,

$$\begin{aligned} Y_{it}^* &= \beta' x_{it} + u_{it} \\ Y_{it} &= 0 \text{ if } Y_{it}^* \leq 0 \\ Y_{it} &= Y_{it}^* \text{ if } Y_{it}^* > 0, \end{aligned}$$

where Y_{it}^* is the index or latent variable, Y_{it} is the observed dependent variable, β is a $(K \times 1)$ vector of unknown parameters; x_{it} is a $(K \times 1)$ vector of explanatory variables; u_{it} are residuals that are independently and normally distributed, with mean μ and variance σ^2 . Given the nature of the model, it is possible to obtain three conditional mean functions in this case

$$\begin{aligned} E(Y_{it}^* / x_{it}) &= \beta' x_{it} \\ E(Y_{it}^* / x_{it}, Y_{it} > 0) &= \beta' x_{it} + \sigma \lambda_{it} \text{ and} \\ E(Y_{it} / x_{it}) &= \Phi(\beta' x_{it} / \sigma) (\beta' x_{it} + \sigma \lambda_{it})^{33}, \end{aligned}$$

where $\lambda_{it} = \phi(\beta' x_{it} / \sigma) / \Phi(\beta' x_{it} / \sigma)$, and ϕ and Φ are the pdf and cdf of standard normal distribution. The elasticity estimates presented in this study are estimated using the conditional mean function given by $E(Y_{it} / x_{it})^{34}$.

Incidence of Entry

In this model, the dependent variable takes the value 'one' in case the number of entries is greater than zero, else it takes the value zero. Thus the model is:

$$\begin{aligned} Y_{it} &= \beta' x_{it} + u_{it} \\ \text{Where } Y_{it} &= 1 \text{ if number of entries is greater than zero} \\ &= 0 \text{ otherwise} \end{aligned}$$

where β is a $k \times 1$ vector of unknown parameters; x_{it} is a $k \times 1$ vector of known constants; u_{it} are residuals that are independently and normally distributed, with mean zero and variance σ^2 . This model is estimated using the 'Probit' method. In this model, the conditional expectation of the dependent variable is interpreted as the probability of occurrence of the event. The elasticity of the probability with respect to the independent variable x_{it} is calculated as $(\partial P_{it} / \partial x_{it}) \cdot (x_{it} / P_{it})$, where P_{it} are the estimated probabilities. Because of the special interpretation of the conditional mean function, we refer to these elasticities as 'quasi-elasticities'³⁵.

The result of the tobit and probit models will provide us with the direction of relationship between 'entry' and the various explanatory variables. These results can also be used to explore the intensity of these relationships. This can be done by comparing the quasi-elasticities of the coefficients across variables and across different types of entry³⁶.

³³ Maddala (1990) p. 160; Limdep 7.0 Manual p. 591; Judge Chap19 p. 799.

³⁴ See Saha (2001), Appendix 3.3 for more details.

³⁵ See Saha (2001) Appendix 3.4 for more details.

³⁶ The goodness of fit will be tested by χ^2 , measured as $2[\log UR - \log R]$; a likelihood ratio calculated as $\{1 - [\log UR / \log R]\}$, denoted by ρ^2 , will give a measure of coefficient of determination [refer Judge et. al (1988) p. 794]; 'LogUR' stands for the unrestricted and 'LogR' stands for restricted log-likelihood values, where the restriction is that all coefficients have the value 'zero'.

APPENDIX III Measurement of Variables

In this study it is assumed that a period of three years is a reasonable time frame for observing the industry characteristics by a potential entrant for her decision-making. Hence, all the explanatory variables are measured as simple three year averages with a one year starting lag from the year of entry. The details are given below.

Size (SIZE)

$$\text{Size}_{KT} = \text{Log} [\sum s_{i, T-1} + \sum s_{i, T-2} + \sum s_{i, T-3}] / 3$$

where $K = 1$ to 121 ; $T = T_1$ to T_7 ; s_i is the sales of the 'i' th firm in the 'K' th industry; and Size_{KT} is the measure for the 'Size' of the 'K' th industry for the 'T' th year.

Minimum Efficient Scale (MES)

$$\text{MES}_{KT} = [\text{Log} (\sum s_i / N)_{T-1} + \text{Log} (\sum s_i / N)_{T-2} + \text{Log} (\sum s_i / N)_{T-3}] / 3$$

where $K = K_1$ to K_{121} ; $T = T_1$ to T_7 ; s_i is the sales of the 'i' th firm in the 'K' th industry; N is the number of firms in the 'K' th industry; and MES_{KT} is the measure for the minimum efficient scale of operation of the 'K' th industry for the 'T' th year.

Concentration Ratio (CR)

$$\text{CR}_{KT} = [C_{T-1} + C_{T-2} + C_{T-3}] / 3$$

where 'C' is the Herfindahl Index = $\sum (s_i / \sum s_i)^2$

where s_i is the sales of the 'i' th firm in the 'K' th industry; N is the number of firms in the 'K' th industry.

Capital Intensity (CI)

CI_{KT} is the capital intensity for the 'K' th industry for the 'T' th year;

$$\text{CI}_{KT} = \frac{\sum_t \sum_i \text{Capital Employed}_{it}}{\sum_t \sum_i \text{Sales}_{it}} / 3$$

Where $K = K_1$ to K_{121} ; $T = T_1$ to T_7 ; and 'i' stands for a firm in the industry.

Vertical Integration (VI)

Where VI_{KT} is the vertical integration for the 'K' th industry for the 'T' th year;

$K = K_1$ to K_{121} ; $T = T_1$ to T_7 ; and 'i' stands for a firm in the industry.

$$\text{VI}_{KT} = \frac{\sum_t \sum_i \text{Gross Value Added}_{it}}{\sum_t \sum_i \text{Sales}_{it}} / 3$$

Advertising Intensity (AI)

$$\text{AI}_{KT} = \frac{\sum_t \sum_i \text{Advertising Expenditures}_{it}}{\sum_t \sum_i \text{Sales}_{it}} / 3$$

Where AI_{KT} is the advertising intensity for the 'K' th industry for the 'T' th year;

K= K₁ to K₁₂₁; T = T₁ to T₇; and 'i' stands for the firm in the industry.

Distribution & Marketing Intensity (DMI)

$$DMI_{KT} = \frac{\sum_t \sum_i \text{Distribution \& Marketing Expenditures}_{it}}{\sum_t \sum_i \text{Sales}_{it}} \bigg/ 3$$

Where **DMI_{KT}** is the distribution & marketing intensity for the 'K' th industry for the 'T'th year; K= K₁ to K₁₂₁; T = T₁ to T₇; and 'i' stands for a firm in the industry.

Research & Development Intensity (RDI)

$$RDI_{KT} = \frac{\sum_t \sum_i \text{Research \& Development Expenditures}_{it}}{\sum_t \sum_i \text{Sales}_{it}} \bigg/ 3$$

Where **RDI_{KT}** is the research & development intensity for the 'K' th industry for the 'T'th year; K= K₁ to K₁₂₁; T = T₁ to T₇; and 'i' stands for a firm in the industry.

Foreign Technology Purchase Intensity (FTP)

$$FTP_{KT} = \frac{\sum_t \sum_i \text{Foreign Technology Purchase Expenditures}_{it}}{\sum_t \sum_i \text{Sales}_{it}} \bigg/ 3$$

Where **FTP_{KT}** is the foreign technology purchase intensity for the 'K' th industry for the 'T' th year; K= K₁ to K₁₂₁; T = T₁ to T₇; and 'i' stands for a firm in the industry.

Export Orientation (EI)

$$EI_{KT} = \frac{\sum_t \sum_i \text{Exports}_{it}}{\sum_t \sum_i \text{Sales}_{it}} \bigg/ 3$$

Where **EI_{KT}** is the research & development intensity for the 'K' th industry for the 'T' th year; K= K₁ to K₁₂₁; T = T₁ to T₇; and 'i' stands for a firm in the industry.

Return on Capital Employed (ROCE)

$$ROCE_{KT} = \frac{\sum_t \sum_i \text{PBIT}_{it}}{\sum_t \sum_i \text{Capital Employed}_{it}} \bigg/ 3$$

Where \mathbf{ROCE}_{KT} is the returns on the capital employed for the 'K' th industry for the 'T'th year; $K = K_1$ to K_{121} ; $T = T_1$ to T_7 ; and 'i' stands for a firm in the industry.

Industry Risk (IR)

Industry risk is measures as the standard deviation of the industries ROCE over a period of five years with a starting lag of one year.

$$\mathbf{IR}_{KT} = [\text{Std Dev. (ROCE}_{T-j})]$$

Where ROCE is the industries returns on capital employed; $j = 1$ to 5 ; $K = 1$ to 121 ;

$T = T_1$ to T_7 ; and \mathbf{IR}_{KT} is the industry risk for the 'K' th industry for the 'T'th year.

Entry Risk (ER)

$$\mathbf{ER}_{KT} = [\text{Std Dev. (ROCE}_i)_{T-1} + \text{Std Dev. (ROCE}_i)_{T-2} + \text{Std Dev. (ROCE}_i)_{T-3}] / 3$$

Where ROCE_i is the returns on capital employed for the 'i' th firm in the industry; $K = 1$ to 121 ; $T = T_1$ to T_7 ; and \mathbf{ER}_{KT} is the entry risk for the 'K' th industry for the 'T'th year.

Growth (GR)

Growth of the industry is obtained by regressing the equation given below after taking log -

$$\text{Sales}_t = \text{Sales}_0 (1+g)^t$$